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Preparing for Idea Generation

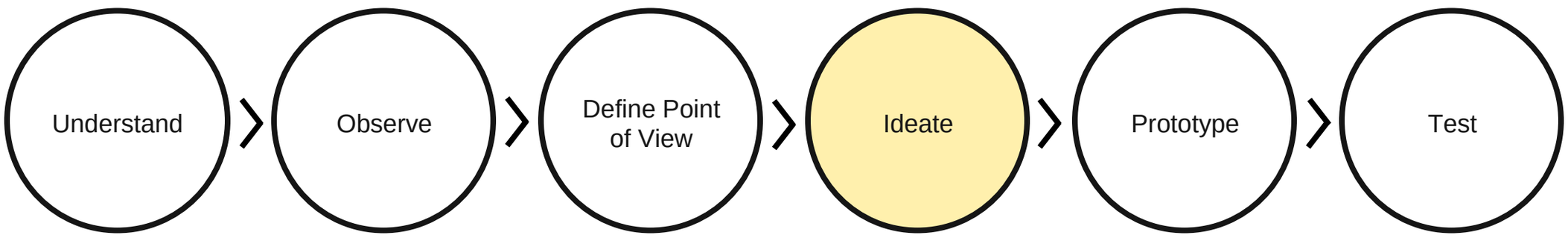
Lecture 6 – Capstone

Alexander Murphy, Ph.D., Assistant Professor

Recall Stage 4: Ideate

Ideation, Concept Generation, Brainstorming

- Using our generated Points of Views, we can start to make strides towards solutions to the design problem.
  - **Divergent Thinking:** Encourage creative, out-of-the-box ideas without judgment or immediate evaluation.
  - **Collaboration:** Engage in group brainstorming sessions to leverage diverse perspectives.
  - **Iteration:** Refine and evolve ideas through continuous feedback and testing. Idea generation by inherently involves building on ideas while incorporating new and disruptive information.
  - **Analogous Thinking:** Draw inspiration from solutions in unrelated fields to generate new ideas for your problem.



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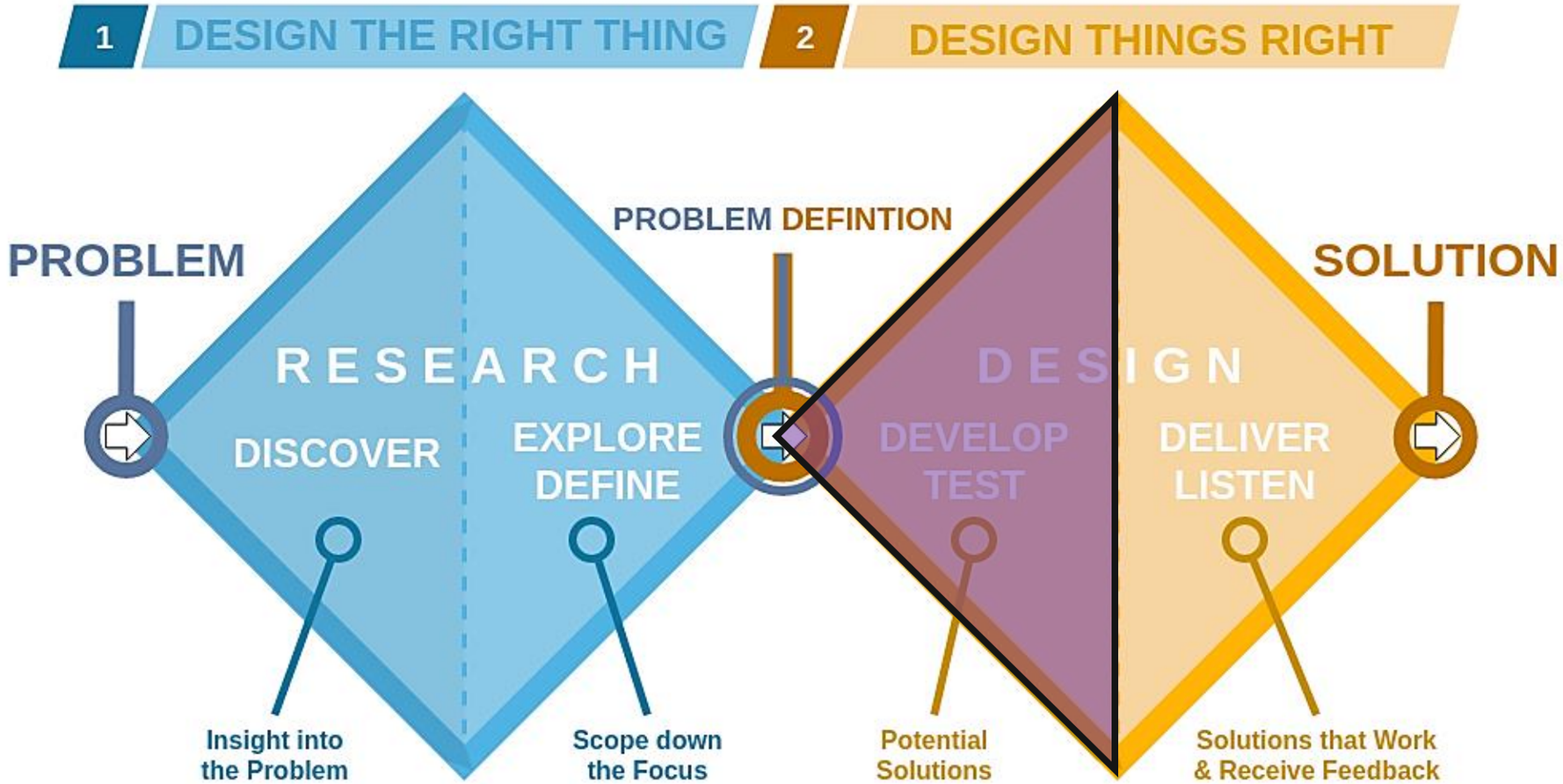
Divergence in Design

Expanding Possibilities



Problem Space **Solution Space**

- Idea generation in design is **divergence** during **solution space** exploration. It helps us understand and define the **boundaries** of the **solution space** before prototyping.

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What is Creativity?

Inspiration: The Spark

- **Definition 1:** the use of the imagination or original ideas, especially in the production of an artistic work.
  - (*Oxford Languages*)

- **Definition 2:** the ability to produce or develop original work, theories, techniques, or thoughts. A creative individual typically displays originality, imagination, and expressiveness.
  - (*American Psychological Association*)

- **Serendipity:** the unexpected discovery of valuable or innovative ideas, solutions, or insights that occur without a specific intent, often while pursuing unrelated objectives.

- **Novelty:** The quality of being new, original, and innovative. It involves introducing unique ideas, solutions, or approaches that have not been seen or applied before in a given context.

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Barriers to Creative Thinking

Perceptual Blocks

- **Stereotyping:** Thinking conventionally or in a formulaic way about an event, person, or process. It is difficult to combine apparently unrelated ideas into an entirely new creative solution if you classify everything based on preconceived notions.

- **Information Overload:** You become so overloaded with minute details that you are unable to sort out the critical aspects of the problem. You need to be able to see the forest before you start looking at the trees.

- **Fixation:** People's thinking can be influenced greatly by their previous experiences. Thus, they are not able to sufficiently recognize alternative ideas. Since divergent thinking is critical to the design process, fixation must be recognized and dealt with.

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Barriers to Creative Thinking

Emotional Blocks

- **Fear of Taking Risks:** This is the fear of proposing an idea that is ultimately found to be faulty. This is instilled in us by the educational process. Truly creative people must be comfortable with taking risks.

- **Unease with Chaos:** People in general (and many of us in STEM fields) are uncomfortable with highly unstructured situations. This may cause you to lose focus on the task at hand.

- **Motivation:** People differ considerably in their motivation to seek creative solutions to challenging problems. Highly creative individuals do this more for personal satisfaction than personal reward. Remind yourself why idea generation is important and find part of the process that your enjoy.

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Barriers to Creative Thinking

Intellectual Blocks

- **Memory Block:** A common form of memory blocking is maintaining a particular search path through memory because of the false belief that it will lead to a solution. This belief may arise from a false hint or any other reason that interrupts the mind's regular problem-solving processes.

- **Insufficient Knowledge:** Usually, ideas are generated from a person's education and experience. This is an excellent reason to work on interdisciplinary design teams. Each of has different lived experiences and have studied in different fields.

- **Incorrect Information:** It is obvious that using incorrect information can lead to poor results. One form of the creative process is the combining of previously unrelated elements or ideas (information); if part of the information is wrong then the result of creative combination will be flawed.

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Barriers to Creative Thinking

Environmental Blocks

- **Physical Environment:** Some people can work creatively with all kinds of distractions; others require strict quiet and isolation. It is important for each person to determine their optimum conditions for creative work, and to try to achieve this in the workplace.

- **Criticism:** Non-supportive remarks about your ideas can be personally hurtful and harmful to your creativity. It is common for students in a design class to be hesitant to expose their ideas, even to their team, for fear of criticism. This lack of confidence comes from the fact that you have no basis of comparison as to whether the idea is good. As you gain experience you should gain confidence, and be able to subject your ideas to friendly but critical evaluations.

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How to Generate Ideas

Fill the Basket

- Creative Confidence
  - Express all and ideas, no matter how silly or outlandish.
  - Design Self-Efficacy: Confidence, motivation, expect success.
  - Help create, foster, and contribute to a relaxed environment.
- Quantity over Quality
  - The more ideas we have, the more options we have later.
  - The best ideas typically come later and later in the process.
- No Criticism of Ideas
  - Judgment is reserved for the next design step: Not Now!
  - Comments about feasibility, realism, or practicality can wait.

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Brainstorming Techniques

Brainstorming Rules

1. **Don’t Criticize:** Criticism slows the process and increases tension.
2. **Prioritize Quantity:** The more ideas you have, the more you understand the solution space.
3. **Combine Ideas:** Each idea doesn’t have to be complete, but combining pieces may get you much closer.
4. **Improve Suggestions:** Building from other’s ideas is constructive, supportive, and the point of being on a team.
5. **Say Everything:** Your oddball ideas may spark someone else’s imagination. That spark doesn’t exist if you don’t share everything.

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Brainstorming Techniques

Brainwriting

- **Step 1:** Ask colleagues to write down their ideas within a prescribed timeframe, conducted synchronously or asynchronously. Ideas can be captured in individual documents which are then shared and collated, or in a single document.
- **Step 2:** Once ideas are captured in a single document, provide a feedback round for the group to weigh in with questions and comments (again either synchronously or asynchronously).
- **Step 3:** Meet together, in person or virtually, to discuss.

Brainstorming Activity

Let's Come Up with Some Ideas

- **Set the Scene (1 minute)**: Choose one of the following problems:
  - **How can we create a better morning routine for busy individuals?**
  - **How can we design a more ergonomic and comfortable laptop stand?**
  - **How can we design a multi-functional backpack that meets the needs of students and professionals?**
- **Individual Brainstorming (2 minutes)**: Write down as many ideas as they can think of related to the problem. Focus on writing down your thoughts, even if they seem silly or wild.
- **Idea Sharing (1 minute)**: After the brainstorming time is up, turn to a neighbor and share your ideas. Take turns briefly explaining your most interesting or favorite idea to your neighbor.
- **Quick Reflection (1 minute)**: Share with the class. Did sharing your ideas give you any new ideas?

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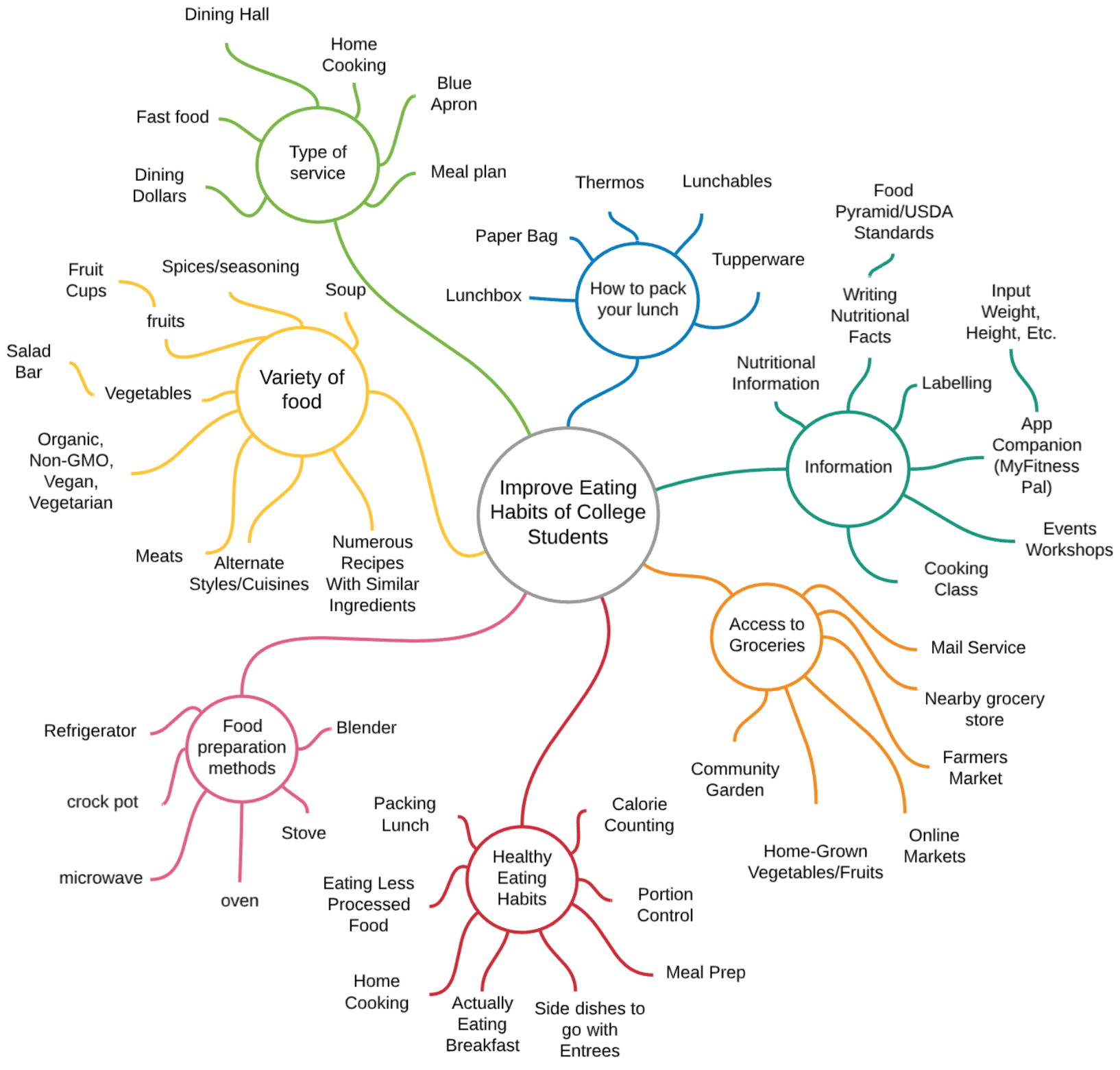
Mindmapping



- Central Problem Statement
- Archive of Ideas
- Connections Between Ideas
- Categories Emerge
- Hierarchies Emerge

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Design by Analogy

Inspiration in Action

- A creative technique that involves drawing inspiration from solutions in different domains to solve current design problems.
- Uses the principle of finding similar structures, functions, or relationships in unrelated areas to inspire innovative ideas.

1. **Identify the Core Problem**: Clearly define the problem you're trying to solve.
2. **Find Analogous Situations**: Look for similar problems or systems in different fields (e.g., nature, other industries).
3. **Draw Connections**: Identify key similarities and differences between the analogous situation and your problem.
4. **Generate Ideas**: Use these insights to brainstorm new solutions or approaches.

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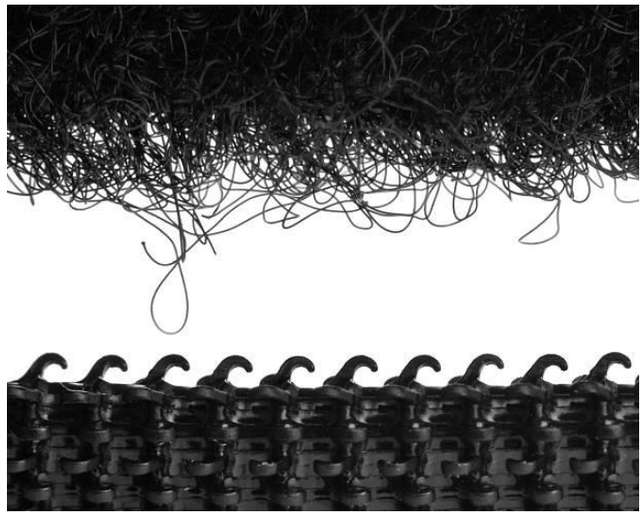
Bio-Inspired Design

Learning from Nature

- **Ask Nature:** https://asknature.org
- **Velcro**: Inspired by the way burrs stick to animal fur.
- **Bullet Train Nose Design**: Modeled after the shape of a kingfisher's beak for reduced noise and improved efficiency.
- **Self-Cleaning Surfaces:** Inspired by the lotus effect, where water droplets roll off lotus leaves, carrying dirt away due to micro-surface structures.
- **Keeping a House Warm:**
  - House is Cold -> Bears Aren't Cold -> Bears Have Fur -> Cover House w/ Fur



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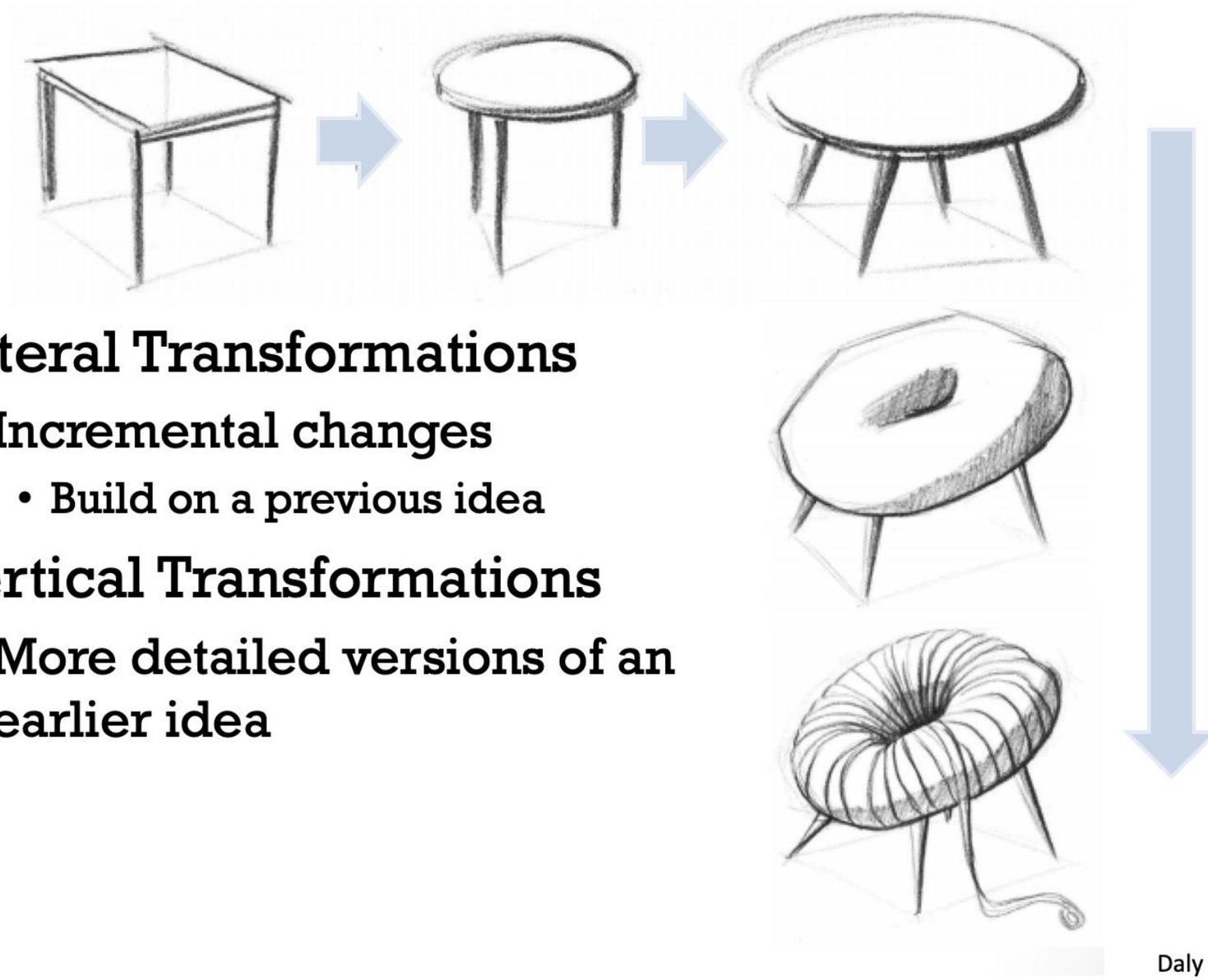
Design Heuristics

Rules of Thumb for Design Transformation

- https://www.designheuristics.com



- Lateral Transformations
  - Incremental changes
    - Build on a previous idea
- Vertical Transformations
  - More detailed versions of an earlier idea

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Brainstorming & Heuristics

- **Substitute:** Other materials, components, people, or processes.
- **Combine:** Two things as one thing, mixing, connecting.
- **Adapt:** Similar processes or things, use in different contexts.
- **Modify:** Change meaning, increase/decrease, larger/smaller.
- **Put to Other Uses:** What should change for a different situation?
- **Eliminate:** Remove and operate, minimize functionality.
- **Rearrange:** Reconfiguration, different order, other patterns.

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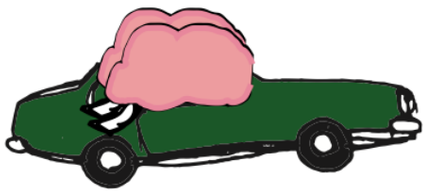
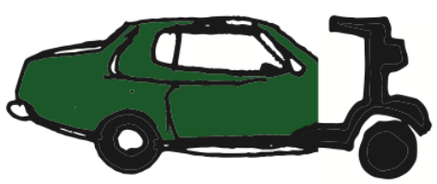
SCAMPER Example

Consider a Car…

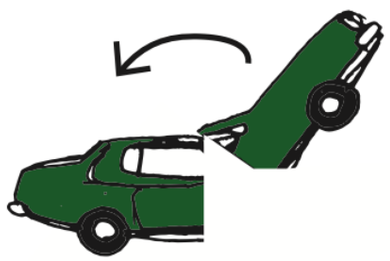
Substitute
Autonomous vehicle
Artificial intelligence instead of human intelligence



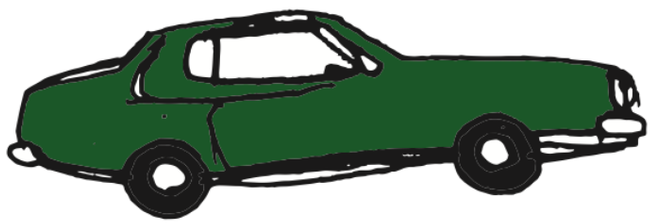
Combine
Vehicle + scooter
Steering of a scooter and space of a car



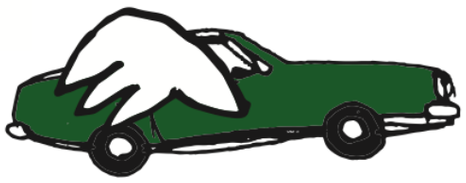
Rearrange
Folding vehicle



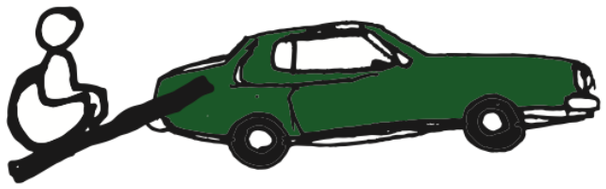
Example car



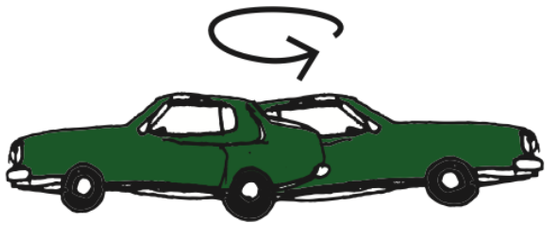
Adapt
Vehicle + bird wings



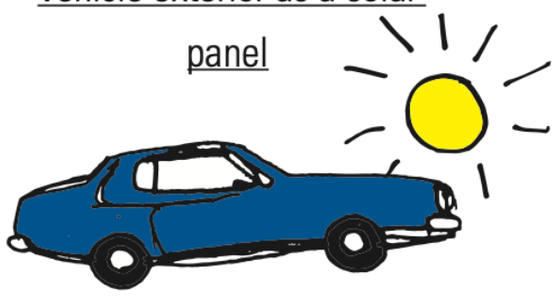
Modify
Wheelchair ramp from the rear



Eliminate
360° turn instead of reverse gear



Put to other uses
Vehicle exterior as a solar panel



Lewrick, Michael, Patrick Link, and Larry Leifer. *The design thinking playbook: Mindful digital transformation of teams, products, services, businesses and ecosystems*. John Wiley & Sons, 2018.

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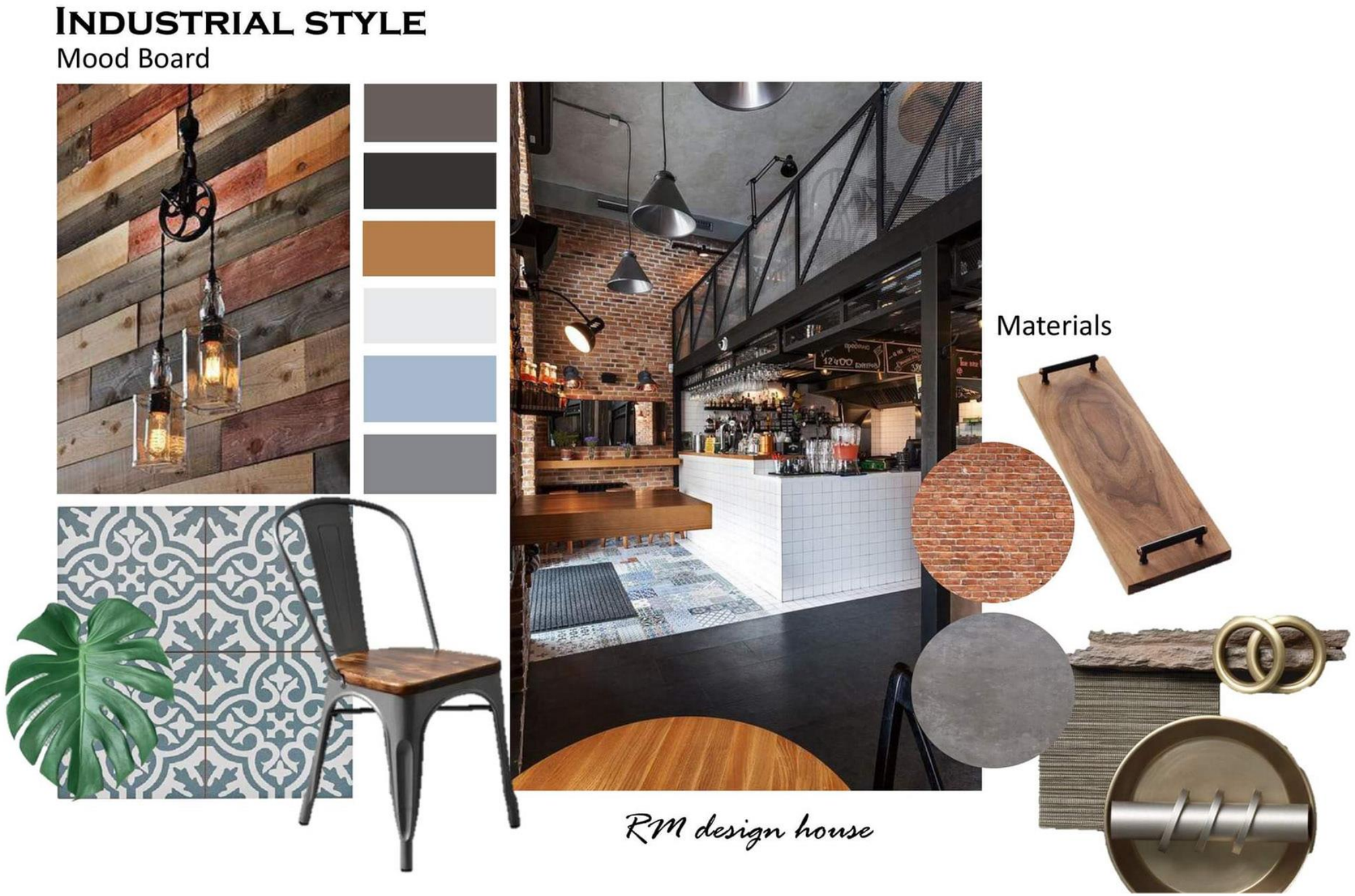
Mood Boards

Credit: Rania Mohy (https://www.behance.net/rania_mohy30bc)



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6-3-5

6 People, 3 Ideas, 5 Minutes

- **Step 1:** Form groups of 6 persons each and explain the problem.
- **Step 2:** Give each participant a sheet of paper with a grid consisting of three columns and six rows.
- **Step 3:** The participants write three ideas in the first row of the sheet within a defined period of time (3-5 minutes). The whole thing is done without speaking.
- **Step 4:** When the set time is over, the sheet is passed clockwise to the next group member.
- **Step 5:** Give participants some time to look at the ideas already written down. Then ask participants to complete the next row on the sheet with more ideas, again within the defined time period.
- **Step 6:** The process of passing on and completing the sheet is repeated until all rows, or boxes, have been filled.
- **Step 7:** Cluster and evaluate the ideas with the team and agree on the next steps.

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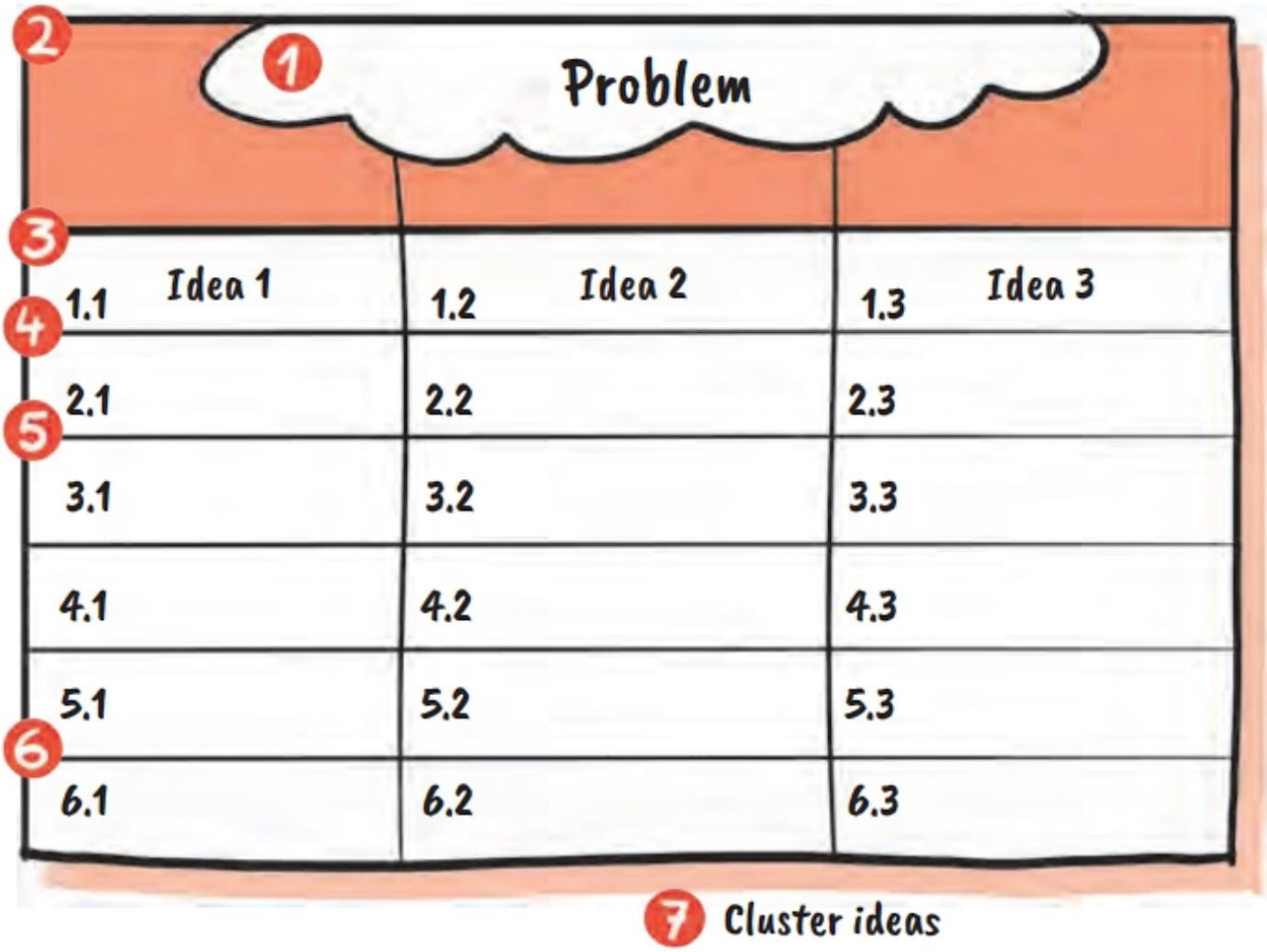
6-3-5 Template

Might be Useful to You?



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Gallery Method

Like a Museum of Ideas

- Step 1: Prepare the Gallery
  - Collect everyone’s ideas and hang them on the walls.
- Step 2: Set Evaluation Criteria
  - What metrics are going to be used to evaluate the ideas?
- Step 3: Conduct the Gallery Walk
  - Have the designers consider everyone else’s ideas.
- Step 4: Collect Feedback
  - Collect feedback from all designers on each idea.
- Step 5: Refine & Iterate
  - Analyze & organize feedback so its useful for iteration.

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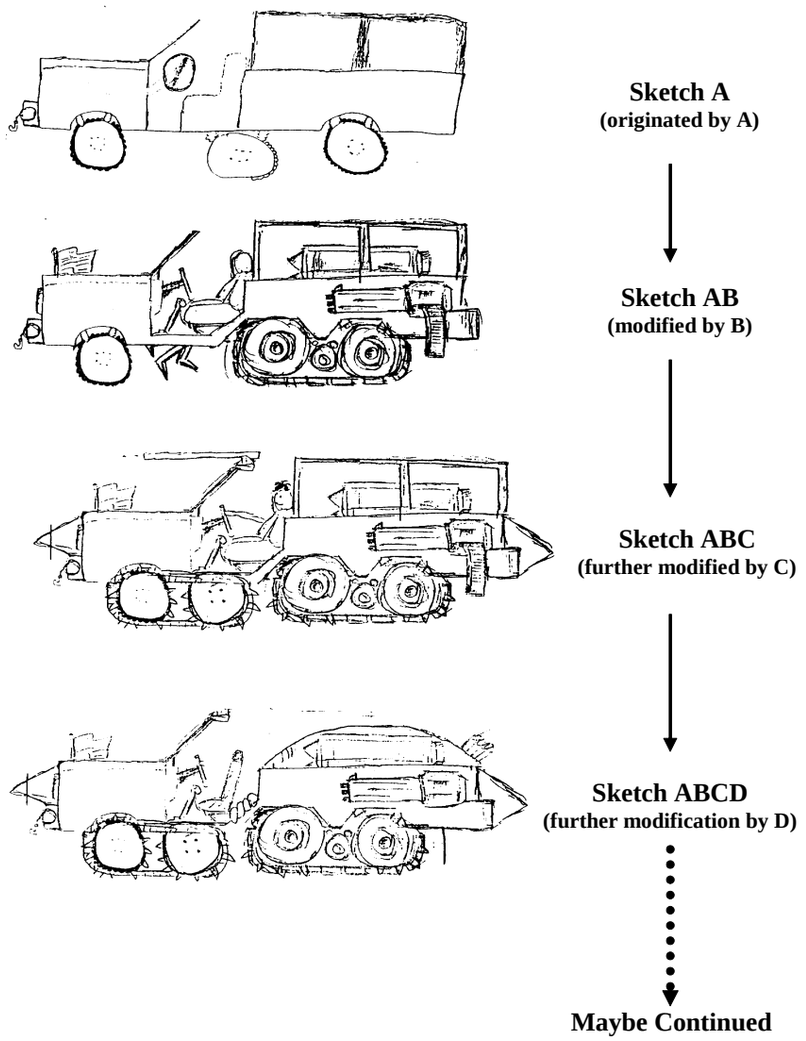
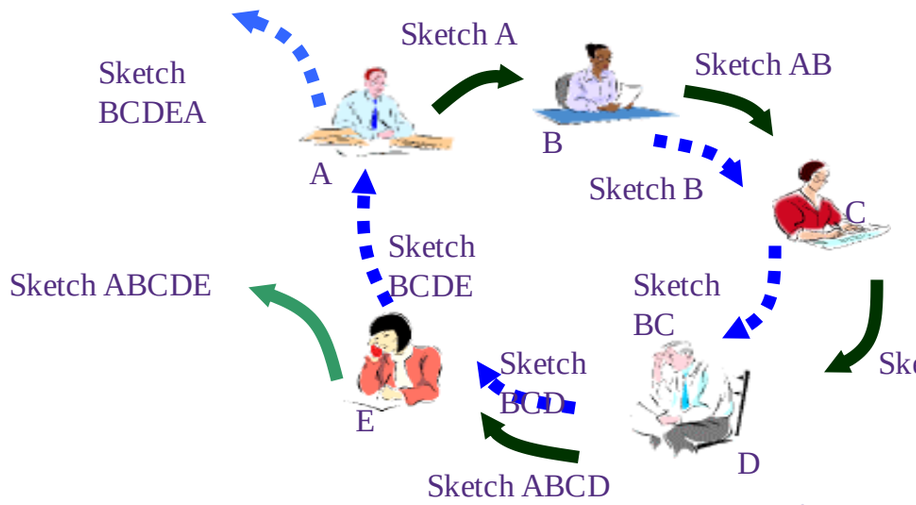
C-Sketch

Sketch-Sketch-Pass

- Every team member initially spends 6 minutes (or n-minutes) sketching an idea.
- After every 6 minutes of individual idea generation, pass the sketch to the person on your right until you get your original sketch back.
- Rules:
  - No verbal communication
  - No text communication
  - Cannot erase the entire drawing
  - Can delete, modify, or add elements from/to the drawing
- Experiments suggest that drawing time should be around 6 minutes for moderately complex problems





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Questions?

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